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ABSTRACT

This document, produced by a committee of teachers in mathematics, includes a program description with pertinent extracts from the school district philosopy, as well as major goals and objectives. Curricular objectives state what a student should know, demonstrate, or be able to do in this study area. The sequence of goals and objectives represents three levels of standards: graduation standards for all students, desirable standards for those students wishing to further their education in technical or vocational studies, and advanced standards for those students planning to attend a four-year college or university. (VT)

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ED157506

HUNTINGTON BEACH UNION HIGH SCHOOL DISTRICT

COMPETENCY-BASED CURRICULUM

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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MATHEMATICS

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Title: Competency Based Curriculum Continuums: Reading, Mathematics, Language Arts, Career Education, Physical Education, Industrial Education, Business Education, Social Science, Science, Health & Recreation, Home Economics, Special Education, Foreign Language, Traffic & Safety Education, Music, Arts & Crafts

Abstract (up to 200 words):

The Huntington Beach Union High School District formed committees consisting of at least two teachers from each school selected for each of the sixteen identified disciplines: Reading, Mathematics, Language Arts, Career Education, Physical Education, Industrial Education, Business Education, Social Science, Science, Health & Recreation, Home Economics, Special Education, Foreign Language, Traffic & Safety Education, Music, Arts & Crafts, Each committee produced a document including the following:

1. Program Description -- with pertinent extracts from the District philosophy, major goals and objectives of the study area.
2. Curricular Objectives -- statements describing what a student should know, demonstrate, or be able to do in that study area.

Each committee established the sequence of goals and objectives representing three levels of standards: Graduation standards for all students; desirable standards for those students wishing to further their education in technical or vocational studies; and advanced standards for those students planning to attend a four-year college or university. The continuums have been community validated and Board approved.

Huntington Beach Union High School District

PROGRAM DESCRIPTION - MATHEMATICS

PHILOSOPHY

We believe that the educational program should promote excellence based upon the optimum fulfillment of each individual's capabilities as determined by his experiences, needs, and incentives. We commit mathematics instruction to a partnership with Reading and Language Arts to provide basic skills competencies to the graduates of the Huntington Beach Union High School District.

We believe that mathematics contributes to the intellectual growth of the individual by a course of study which emphasizes logical reasoning and sound decision-making. The purpose of these studies is to stress the structural nature of reality and the necessity for basic computational skills to enable the student to describe, understand, interpret, and appreciate his environment. Mathematical education and training seek to provide the student with the means to become a functional member of a rapidly-changing society.

MAJOR GOALS OF THE DISCIPLINE

1. Each student, in accordance with his innate potential, will acquire and develop those skills and understandings necessary for the next step in the hierarchy of mathematics education.
2. Students will have the opportunity to understand consumer mathematics principles and to develop an understanding of the effective use of these in living.
3. Each student will learn to use mathematics in problem solving.
4. Students will experience an awareness of the mathematical structure of the environment.

MAJOR OBJECTIVES OF THE DISCIPLINE

1.1 Each student will acquire skill in the fundamental operations of mathematics.

1.2 Students will be exposed to the objectives of each course in mathematics as set up by the district.

1.3 Students will acquire on-going counseling with respect to their mathematical studies.

2.1 Students will be provided with the mathematical skills needed to become informed consumers.

3.1 Students will acquire exposure to the techniques of mathematical problem analysis.

3.2 Students will acquire the techniques of problem analysis as related to other fields of endeavor.

4.1 When appropriate, students will be provided with mathematical models related to our environmental structure.

GLOSSARY OF TERMS

An explanation of the categories in which the curricular objectives have been placed is necessary to fully understand the division of categories. Following is our definition of the three categories.

1. GRADUATION STANDARDS

   The objectives constitute the graduation standards for all students who will be recommended for a diploma. Students must demonstrate proficiency in accomplishing each of these objectives, as measured by a uniform test in the district.

2. DESIRABLE STANDARDS

   This category of objectives is geared toward those students who not only will complete the high school graduation, but plan to continue further formal education, either in technical school or at a community college. Completion of these objectives requires greater achievement than those objectives in the GRADUATION STANDARDS. However, students functioning in this category must also complete, satisfactorily, the GRADUATION STANDARDS objectives.

3. ADVANCED STANDARDS

   The objectives in this category are designed for students who plan to attend a four year college or university. Completion of these objectives should enable a student to have the background, knowledge, and skills necessary to compete well at a four year institution. Students functioning in this category must also complete the objectives in the GRADUATION STANDARDS to insure that they have met the graduation requirements.

Objectives in each of these three categories constitute the essentials that a student should know, demonstrate, or be able to do. Learning beyond these objectives may well occur in any given classroom situation.

HR:sdc

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT
The student will be able to add, subtract, multiply, and divide whole numbers, fractions and decimals and to apply these operations to the following: GRADUATION STANDARDS. 1. PERCENT a. Sales tax b. Cost of credit c. Discount d. Interest (simple) e. Taxes related to income f. Property taxes 2. READING OF GRAPHS a. Bar graphs b. Line graphs c. Circle graphs d. Pictographs 3. WAGES a. Hourly rate b. Overtime c. Piece work d. Commission e. Salary 4. MEASUREMENTS (English - Metric) a. Linear b. Area c. Volume d. Weight e. Temperature f. Time g. Map reading h. Utility meter reading i. Time - distance - speed		

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT
GRADUATION STANDARDS (Con't.) 5. CHECKING ACCOUNTS 6. BUDGETING a. Transportation b. Housing c. Utilities d. Food e. Clothing f. Medical g. Other 7. COMPARATIVE PRICING ON A UNIT BASIS 8. APPROXIMATIONS OF THE CORRECT ANSWERS TO MATHEMATICAL PROBLEMS		

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT
GENERAL MATH - 1st Semester The student will be able to: GRADUATION STANDARDS 1. Determine the place value of any particular digit. 2. Round off a number of any place value. 3. Add, subtract, multiply and divide whole numbers. 4. Add, subtract, multiply, and divide fractions (rational numbers). 5. Add, subtract, multiply, and divide decimals. 6. Compare fractions and decimals and determine which is the larger. 7. Change a decimal to a common fraction (or change a common fraction to a decimal). 8. Change a fraction to a % (or change a % to a fraction). 9. Change a decimal to a % (or change a % to a decimal). 10. Find any percentage of any common rational number. **GENERAL MATH - 2nd Semester** GRADUATION STANDARDS 11. Compute simple interest. 12. Find the area and perimeter of a square and a rectangle. 13. Measure using a protractor or a meter-stick. 14. Convert one unit of measure to another unit of measure within the metric system. 15. Derive numerical information from graphs.		

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT
GENERAL MATH - 2nd Semester (Con't.) DESIRABLE STANDARDS 16. Draw various types of polygons and angles. 17. Identify the common figures in geometry. 18. Show the advantages of the metric system. 19. Construct graphs (Bar, line, circle and pictograph). 20. Determine the mean, mode, and median.		

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT

CONSUMER MATH

The student will be able to apply basic arithmetic skills to the following areas:

GRADUATION STANDARDS

1. PERCENT
   a. Sales tax
   b. Cost of credit
   c. Discount
   d. Interest (simple)
   e. Taxes related to income
   f. Property taxes

2. READING OF GRAPHS
   a. Bar graphs
   b. Line graphs
   c. Circle graphs
   d. Pictographs

3. WAGES
   a. Hourly rate
   b. Overtime
   c. Piece work
   d. Commission
   e. Salary

4. MEASUREMENTS (English - Metric)
   a. Linear
   b. Area
   c. Volume
   d. Weight
   e. Temperature
   f. Time
   g. Map reading
   h. Utility meter reading
   i. Time - distance - speed

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT
CONSUMER MATH (Con't.) GRADUATION STANDARDS (Con't.) 5. CHECKING ACCOUNTS 6. BUDGETING a. Transportation b. Housing c. Utilities d. Food e. Clothing f. Medical g. Other 7. COMPARATIVE PRICING ON A UNIT BASIS 8. APPROXIMATIONS OF THE CORRECT ANSWERS TO MATHEMATICAL PROBLEMS		

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT

The student will be able to:

DESIRABLE STANDARDS

1. Use addition and multiplication properties of rational and irrational numbers.
2. Solve linear equations in one variable.
3. Solve systems of equations in two variables.
4. Solve equations containing fractional expressions.
5. Perform operations of addition, subtraction, multiplication and division with polynomials.
6. Graph linear equations and inequalities on the number line and in the coordinate plane.
7. Translate words of a problem into an open sentence using either one or two variables.
8. Simplify square roots of algebraic expressions.
9. Evaluate algebraic expressions.
10. Solve quadratic equations by:
    a. Factoring.
    b. Using the quadratic formula.
11. Solve linear inequalities.
12. Perform operations on polynomials using powers and roots, including zero exponents.
13. Factor polynomials that fit patterns of greatest common factor, difference of squares, square trinomials, general trinomials and grouping.
14. Write the equation of a line given sufficient information.

ADVANCED STANDARDS

1. Solve quadratic equations by completing the square.
2. Recognize quadratic functions whose graphs are parabolas.
3. Perform operations on polynomials using powers and roots, including negative exponents.

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT

GEOMETRY

The student will be able to:

DESIRABLE STANDARDS

1. Present logical, concise, step-by-step proofs of geometric statements.
2. Use the terms: lies on, lies in, is a point of, passes through, intersects, contains.
3. Recognize geometry as an axiomatic system.
4. Distinguish between and use inductive and deductive reasoning.
5. Work with a conditional and its converse.
6. Demonstrate a logical 2-column proof of a geometric statement.
7. Write simple indirect proofs.
8. Prove triangles congruent.
9. Identify rectangles, squares, rhombuses, trapezoids and prove and apply their properties.
10. Solve problems involving similar polygons.
11. Use ratios and proportions with respect to tangents, secants and chords of circles.
12. Determine the slope and equation of a line.
13. Determine the apothem, radius, and measure of the central angle of a regular polygon.
14. Draw representations of points, lines and planes, etc.
15. Identify and label angles and polygons.
16. Determine the sums and differences of angle measurements.
17. Determine complement and supplement of an angle.
18. Sketch and give examples of parallel lines, skew lines, parallel planes, and perpendicular planes.

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES		SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT
GEOMETRY (Con't.)			
DESIRABLE STANDARDS	19. Determine the sum of the measure of the interior angles of a regular polygon.		
	20. Use auxiliary lines.		
	21. State and use facts about parallelograms.		
	22. Use the properties of 30-60-90 and 45-45-90 triangles.		
	23. State and apply the Pythagorean Theorem.		
	24. Find the measure of angles and areas with respect to circles.		
	25. Construct the five basic constructions using a compass and straightedge.		
	26. Determine the distance between two points and find the mid-point of a segment in the coordinate plane.		
	27. Determine the circumference, radius, diameter of a circle.		
	28. Determine the area of given geometric figures.		
	29. Determine the volume of given figures.		
	30. Determine the lateral area of given figures.		
ADVANCED STANDARDS	1. Same competencies as above (1 through 30) in greater depth.		

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT

ALGEBRA II

The student will be able to:

ADVANCED STANDARDS

1. Use the addition and multiplication properties of the complex number system.
2. Solve systems of linear and/or quadratic equations in 2 or more variables, over the set of complex numbers.
3. Determine the nature and number of the roots of an equation.
4. Solve equations of degree higher than 2 by use of the rational root theorem and synthetic substitution.
5. Solve and graph inequalities.
6. Know rules for powers and roots of polynomials using positive, negative, zero and fractional exponents.
7. Factor polynomials over integers, rational numbers, irrational numbers and complex numbers.
8. Identify a relation and a function.
9. Graph linear functions in 2 variables, using slope, intercept, and other forms of the equations of a line.
10. Recognize the equations of a circle, parabola, hyperbola and ellipse, and graph in a coordinate plane.
11. Understand basic laws of logarithms.
12. Solve linear and quadratic equations.
13. Solve equations containing radical expressions.
14. Solve equations containing fractional expressions.
15. Perform operations of addition, subtraction, multiplication and division with polynomials.
16. Use an organized algebraic approach to verbally stated problems using one or two variables.

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT

TRIGONOMETRY

The student will be able to:

ADVANCED STANDARDS

1. Use the 6 trigonometric and circular functions.
2. Prove trigonometric identities including sum and difference formulas.
3. Solve trigonometric equations.
4. Solve general triangles by using the law of sines and the law of cosines.
5. Graph the 6 trigonometric functions.
6. Solve right triangles.
7. Use trig tables.
8. Solve practical problems involving trig functions.

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT
PROBABILITY & STATISTICS The student will be able to: ADVANCED STANDARDS 1. Find the number of combinations of a set of objects in a finite sample space. 2. Solve permutation and combination problems. 3. Apply the Binomial Theorem to a binomial expansion problem. 4. Determine probabilities in a finite sample space. 5. Apply Bayes' Theorem. 6. Compute the mean of a set of data. 7. Compute the standard deviation of a set of data. 8. Demonstrate understanding of the binomial distribution. 9. Demonstrate understanding of the normal distribution.		

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT

ALGEBRA II / TRIG

The student will be able to:

ADVANCED STANDARDS

1. Use the addition and multiplication properties of the complex number system.
2. Solve linear and quadratic equations.
3. Solve systems of linear and/or quadratic equations in 2 or more variables, over the set of complex numbers.
4. Determine the nature and number of the roots of an equation.
5. Solve equations containing radical expressions.
6. Solve equations containing fractional expressions.
7. Solve equations of degree higher than 2 by use of the rational root theorem and synthetic substitution.
8. Solve and graph inequalities.
9. Perform operations of addition, subtraction, multiplication and division with polynomials.
10. Know rules for powers and roots of polynomials using positive, negative, zero and fractional exponents.
11. Factor polynomials over integers, rational numbers, irrational numbers and complex numbers.
12. Identify a relation and a function.
13. Graph linear functions in 2 variables, using slope, intercept, and other forms of the equations of a line.
14. Recognize the equations of a circle, parabola, hyperbola and ellipse, and graph in a coordinate plane.
15. Understand basic laws of logarithms.
16. Use an organized algebraic approach to verbally stated problems using one or two variables.

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES		SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT
ALGEBRA II / TRIG (Con't.)			
ADVANCED STANDARDS (Con't.)	17. Use the 6 trigonometric and circular functions. 18. Solve right triangles. 19. Prove trigonometric identities, including sum and difference formulas. 20. Solve trigonometric equations. 21. Solve general triangles by using the law of sines and the law of cosines. 22. Graph the 6 trigonometric functions.		

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT
MATH ANALYSIS The student will be able to solve problems involving: ADVANCED STANDARDS 1. Definitions of six circular and trigonometric functions. 2. Graphs of six circular functions including phase shift, amplitude, and period. 3. Identities. 4. Sine, cosine, and tangent of sum and difference of two angles. 5. Double and half angle formulas. 6. Composition and inverses of functions. 7. Inverse of trig and circular functions. 8. Trigonometric equations. 9. Proofs by mathematical induction: Divisibility, trig, factorials, series, exponents. 10. Sequences and series. 11. Binomial theorem. 12. Algebra of vectors. 13. Conversion of cartesian coordinates to polar coordinates. 14. Polar graphs. 15. Operations with polar form of complex numbers including DeMoivre's theorem. 16. Conic sections. 17. Transformation of coordinates. 18. Determination of the existence of limits and evaluation of limits.		

CURRICULAR OBJECTIVES

MATHEMATICS COMPETENCIES	SUGGESTED LEARNING ACTIVITIES & SUGGESTED MULTI-MEDIA MATERIALS	MEANS OF ASSESSMENT
COMPUTER MATH The student will be able to: DESIRABLE STANDARDS 1. Understand the general concept and use of data processing. 2. Use the computer terminals located at his school. 3. Solve problems logically by constructing flowcharts using the correct symbols and rules for flowcharting. 4. Use the following system commands: ID, OFF, SAVE, DELETE, INPUT, LIST, PROMPT, END, DISPLAY, UPDATE, CHANGE, EDIT, LOAD, PURGE, RENAME, CANCEL, PRINT, EXEC, AND RUN. 5. Use the BASIC programming commands (REM, STOP, LET, READ, DATA, INPUT, RESTORE, PRINT, DIM, GO TO, IF/THEN, FOR/NEXT, AND DEF.) to direct the computer to solve problems. 6. Use numeric and string variables in solving problems. 7. Use the update and editing capabilities of the system.		